Conducting systematic reviews in the field of educational technology

A workshop to get you started

ALT Conference **7 September 2022**

https://tinyurl.com/mr3bc2ye

Dr Nina Bergdahl
nina.Bergdahl@hh.se
@Nina_Bergdahl

Katja Buntins
katja.buntins@uni-due.de

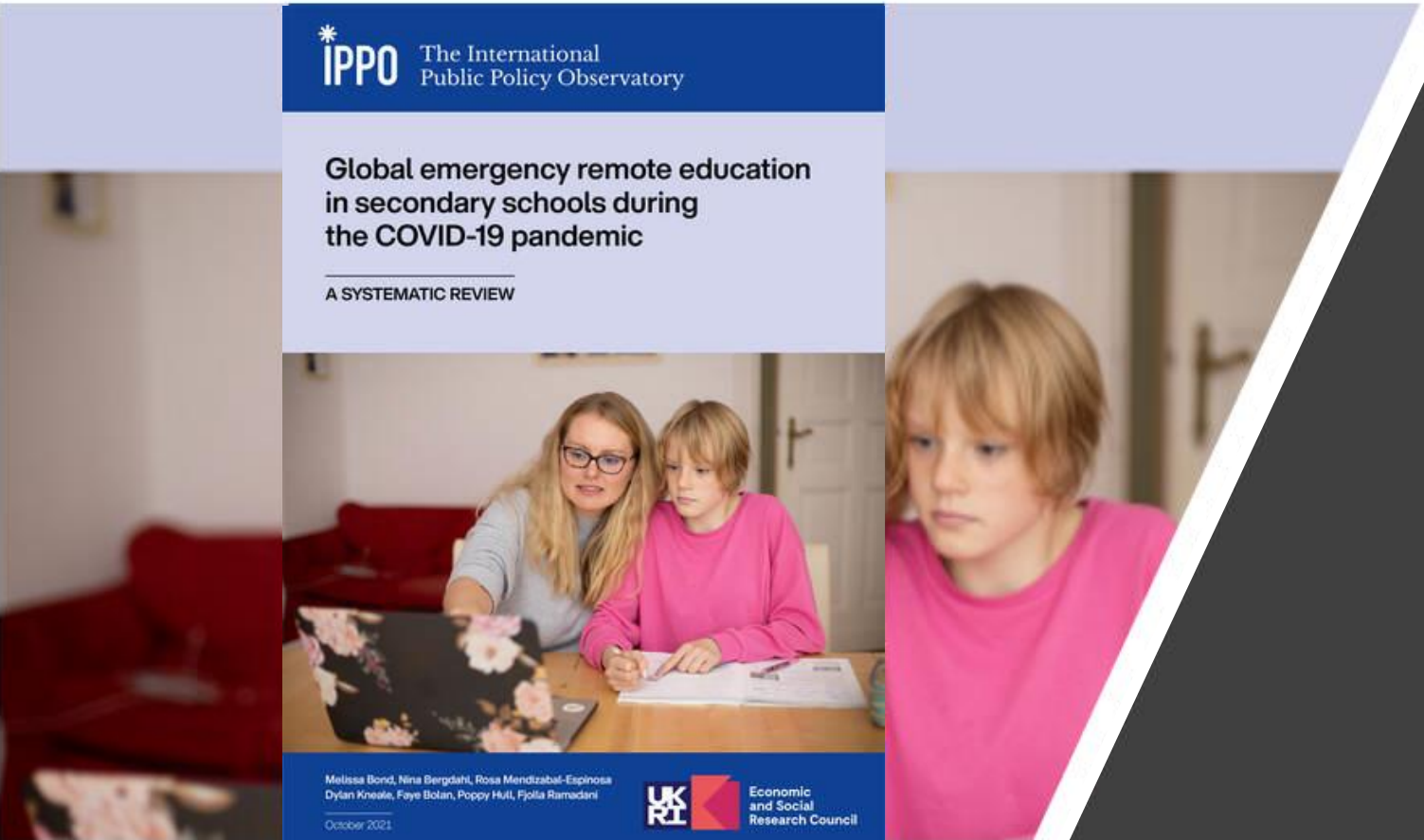
Dr Melissa Bond
melissa.bond@unisa.edu.au
@misc_nerd

Agenda

1. Presenter backgrounds
2. Benefits and challenges of reviews
3. Systematic review process
4. Generating research questions
5. Developing search strings
6. Inclusion/exclusion criteria
7. Introduction to EPPI-Reviewer, importing and screening
8. Hands-on activities
9. Q&A

https://tinyurl.com/mr3bc2ye


Olaf Zawacki-Richter ·
Michael Kerres · Svenja Bedenlier ·
Melissa Bond · Katja Buntins Eds.
RESEARCH
Systematic Reviews in Educational Research
Methodology, Perspectives and Application


IPPO
The International Public Policy Observatory
Global emergency remote education in secondary schools during the COVID-19 pandemic
A SYSTEMATIC REVIEW
Melissa Bond, Nina Bergdahl, Rosa Mendizabal-Espinosa
Dylan Kneale, Faye Bolan, Poppy Hull, Fjolla Ramadani
October 2021
UKRI
Economic and Social Research Council

Presenters

Evidence synthesis

Example published reviews

- Student engagement and educational technology in higher education
- Student engagement and the flipped learning approach (K-12)
- Artificial Intelligence in Higher Education
- Systematic Reviews in Educational Research (co editors)
- COVID-19 studies on teaching and learning in K-12 (rapid review)
- COVID-19 studies on teaching and learning in higher education
- Teaching and learning in secondary schools during COVID-19

Current reviews

- Language bias in educational technology research synthesis
- Learning analytics and student engagement
- Doctoral education and motherhood
- International research collaboration in educational research

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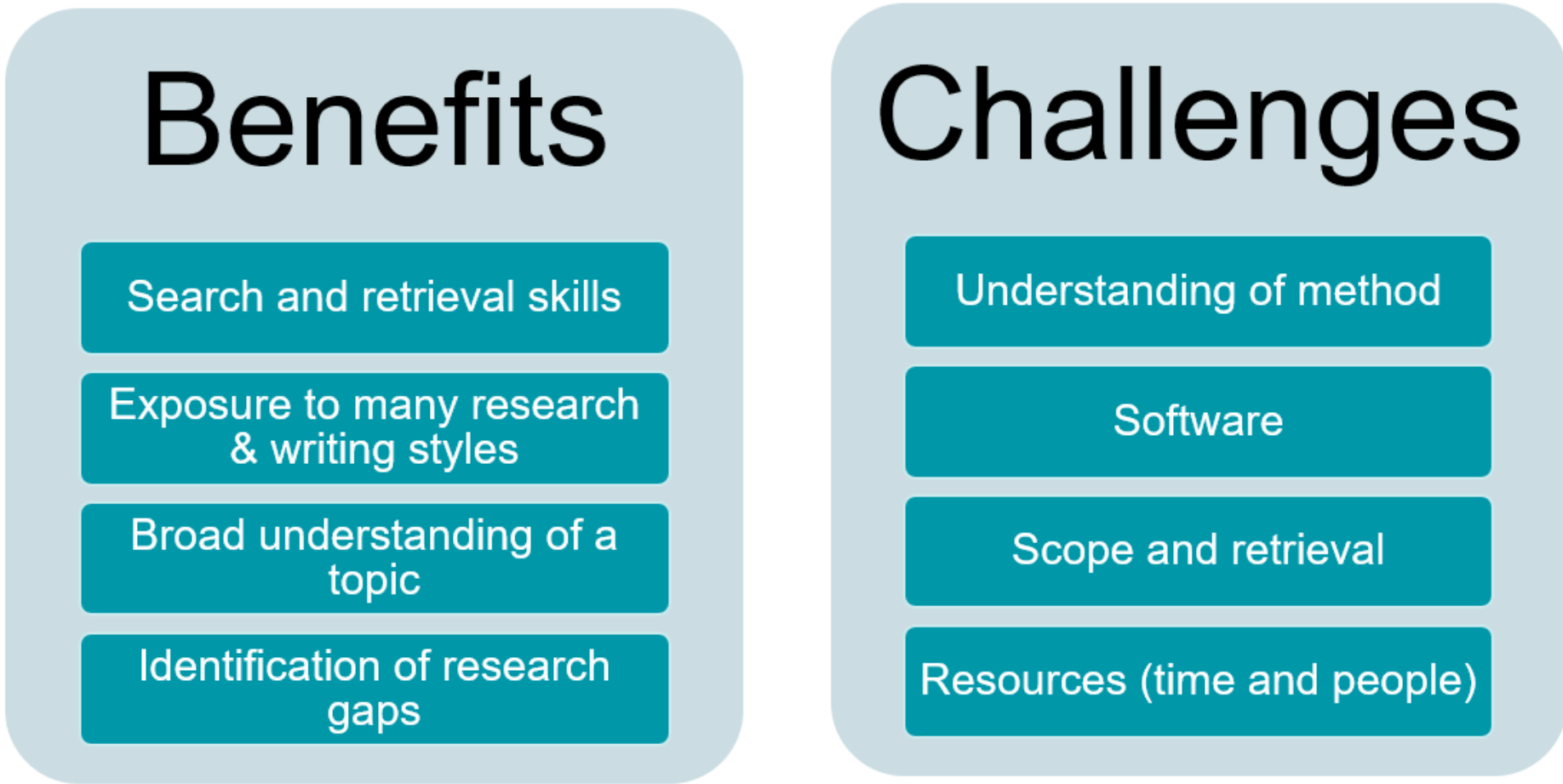
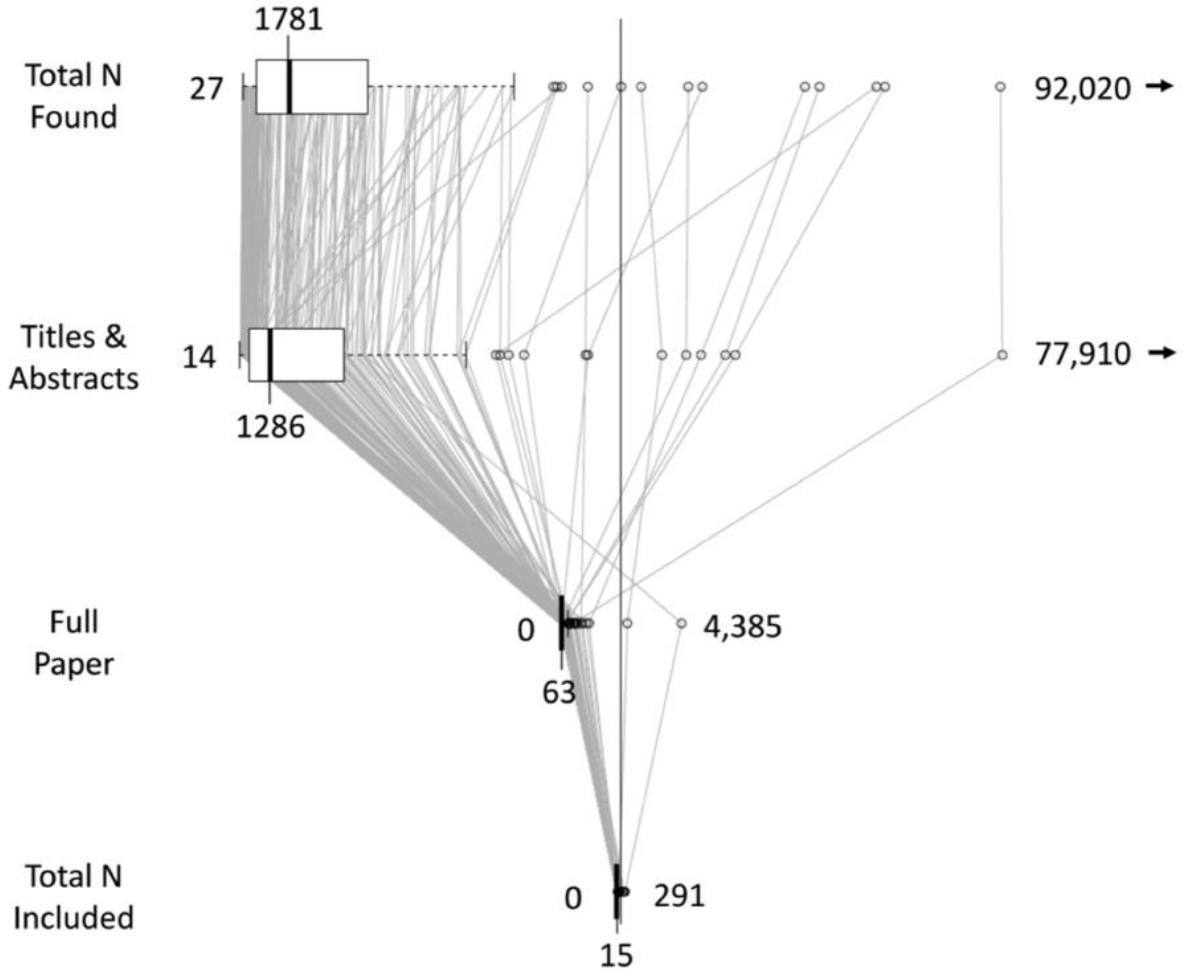
Systematic Review Methodology



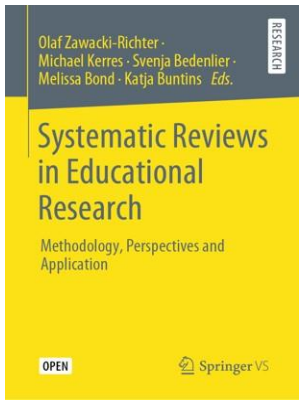
Systematic Review Publication Time

- average of 67 (SD = 31) weeks to conduct and publish a review
- reviews that reported funding took longer (42 vs 26 weeks) and involved more team members (6.8 vs 4.8 people) than reviews that reported no funding
- final average yield rate below 3%



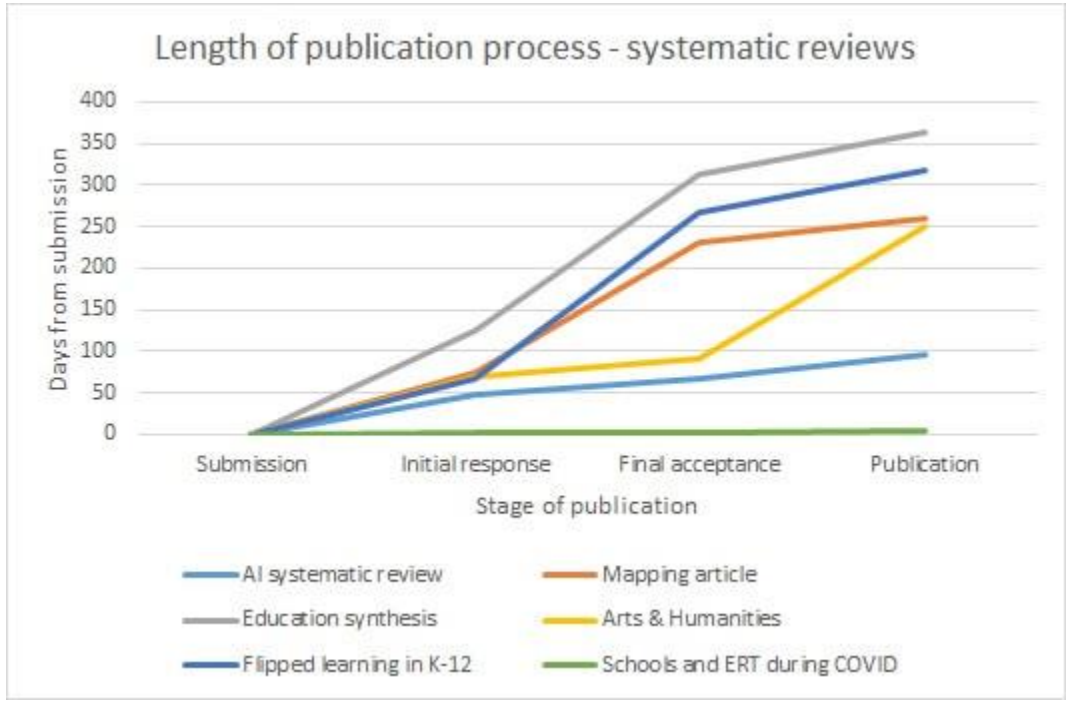
Borah et al. (2017, p. 4), N=195

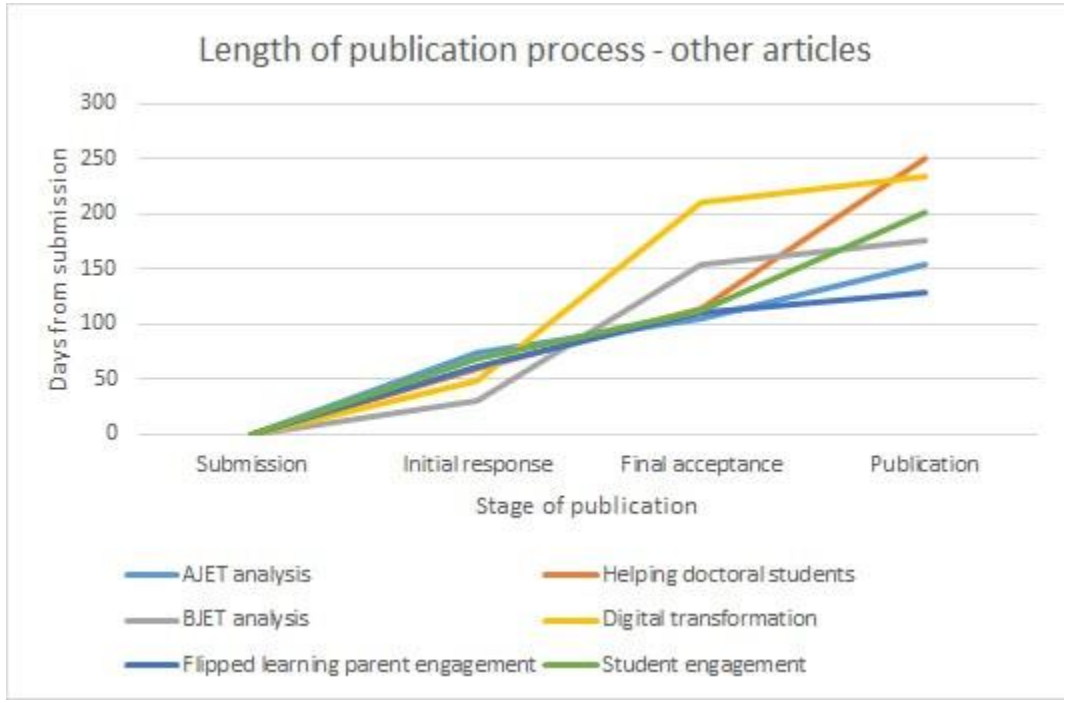
	Tai et al.	Bedenlier et al.	Lo et al.	Goagoses & Koglin	Zawacki-Richter et al.
Topic	conceptualization and measurement of student engagement	student engagement and educational technology in higher education	flipped and video-based learning in various subject areas in higher education	social goals and academic success	AI in higher education
Duration	18 months	24 months	1 – 4 months	11 months	9 months
No of team members	4 authors, 1 research assistant	5 authors, 2 research assistants	1 – 3 authors	2 authors	3 authors, 1 research assistant
Initial references	4,192	77,508	936 – 4,053	2,270	2,656
Final references	186	243	5 – 61	26	146
Yield rate	4.44 %	0.31 %	0.05 – 1.51 %	1.14 %	5.50 %
Databases searched	PsycINFO, ERIC, Education Source, and Academic Search Complete were accessed via Ebscohost, Scopus, Web of Science	ERIC, Web of Science, PsychINFO, and SCOPUS	Academic Search Complete, TOC Premier, and ERIC, PubMed, PsycINFO, CINAHL Plus, and British Nursing Index	Web of Science Core Collection, Scopus, and PsychINFO	EBSCO Education Source, Web of Science, and Scopus



Zawacki-Richter at al. (2020)

Are systematic reviews ‘harder’ to get published?





	Submission to initial response	Initial response to final acceptance	Final acceptance to publication	Entire process
Minimum	3 days (outlier)	1 day	1 day	4 days
Maximum	124 days	201 days	159 days	363 days
Average	64 days (76 removing outlier)	99 days (118 removing outlier)	52 days (63 removing outlier)	215 days (257 removing outlier)

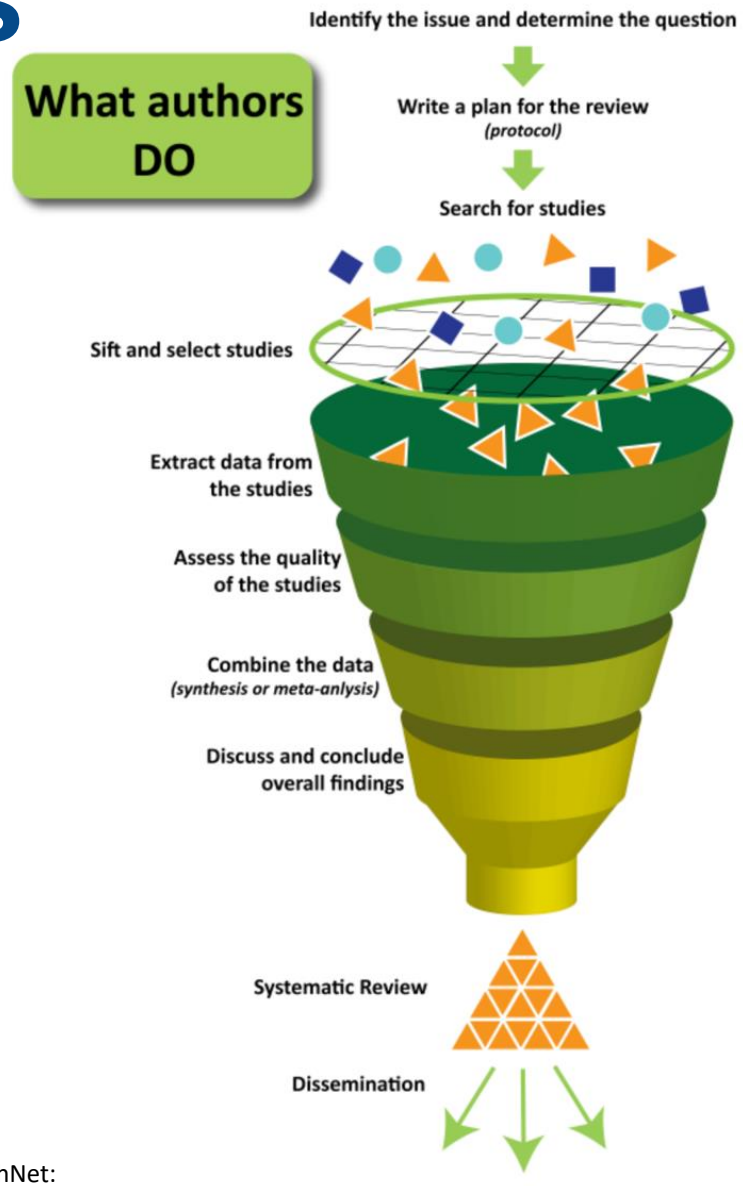
	Submission to initial response	Initial response to final acceptance	Final acceptance to publication	Entire process
Minimum	30 days	31 days	17 days	128 days
Maximum	75 days	163 days	136 days	251 days
Average	57 days	78 days	56 days	191 days

On average, 19 days longer to receive an initial response to a systematic review article, and 40 days longer to final acceptance, with the overall process taking 66 days longer on average for the entire publication process.

Bond, 2021

Systematic Review Process

- Review question and conceptual framework
- Search strategy: search string and selection criteria
- Study screening
  - Title & Abstract
- Study retrieval
- Screen on full text
- Data Extraction
- Quality assessment
- Synthesis
- Report



Retrieved from YourHealthNet: http://navigatingeffectivetreatments.org.au/exploring_systematic_reviews.html (12 Feb, 2019)

Formulating review questions

- Identify and clearly define the question/s your review will address.
  - PICOTS framework (see Boland et al., 2017):
    - **P**opulation (e.g. the types of students)
    - **I**ntervention (e.g. the specific technology)
    - **C**omparator (e.g. compared to traditional classrooms)
    - **O**utcome/s (e.g. student engagement)
    - **T**iming (e.g. between 2012 and 2019)
    - **S**etting (e.g. Africa) OR **S**tudy design (e.g. RCTs)

Formulating review questions

1. What is the scope of the studies that have been published on flipped classrooms in medical education?
2. What is the research quality of the studies examined?
3. What are the effects of the flipped classroom, as reported by controlled studies?
    - **P**opulation: Medical education students (higher education)
    - **I**ntervention: Flipped classroom approach
    - **C**omparator: Conventional classes?
    - **O**utcome: "effects" (learning?)

Chen, Lui, & Martinelli (2017)

Developing search strings

- Your search string combines the key concepts of your question, in order to retrieve accurate results.
- Each database is different, so it’s best to begin with a master list of terms.
- According to Bramer et al. (2018), it is important to:
  - Identify example articles that can answer your question.
  - Decide which key concepts address the different elements of the question.
  - Decide which elements should be used for the best results.
  - Choose an appropriate database to begin with (e.g. WoS).
  - Use the thesaurus feature of the database to identify synonyms.

Brainstorming search terms

Key c

Free t

Learning the basic concepts of programming and its foundations is considered as a challenging task for students to figure out. It is a challenging process for lecturers to learn these concepts, as well. The current literature on programming training abounds with the examples of a wide range of methods employed. Within this context, one of the prominent approaches in programming training is flipped classroom (FC) model. This article has sought to illuminate the effect of cognitive flexibility, problem-solving skills (PSS), and flipped learning readiness (FLR) levels on students' programming achievements in programming training through FC model. A total of 149 freshmen computer science students studying in a state university in Turkey were recruited for this study. In this study, designed as a relational screening model, a personal form, an achievement test, and three different data collection instruments were employed to collect data. For the data analysis, structural equation modeling, a multivariate statistical analysis technique, was used to reveal a model explaining and predicting the relations between programming achievement and different variables. The findings clearly indicate that FLR is the most important predictor of the programming achievements of students in FC. Other important predictors were found as PSS and cognitive flexibility. The research model demonstrates that an increase or development in FLR, PSS, and cognitive flexibility levels in FC will enhance the achievements of students in programming.

Keywords

Author Keywords: programming training; App Inventor; flipped classroom; cognitive flexibility; problem-solving skills; university students

KeyWords Plus: COGNITIVE FLEXIBILITY; SELF-EFFICACY; LANGUAGE; STUDENTS; IMPACT; EDUCATION; DESIGN; PERSPECTIVES; ACHIEVEMENT; RELIABILITY

Cited References

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Author keywords/ keywords plus

Do a quick search in WoS using your concepts and write down relevant author keywords/keywords plus

Brainstorming search terms

	Concept 1	Concept 2	Concept 3	Concept 4
Key concepts	Higher education students	Science, Engineering, Technology	African context	Mobile learning
Free text terms	• higher education • Undergraduate • Postgraduate • university	• Science • Engineering • Technology • STEM	• Africa	• mobile learning • mLearning • m-learning
Author keywords/ keywords plus				mobile devices

Brainstorming search terms

Concepts	Search terms
Higher education students	“higher education” OR undergrad* OR postgrad* OR universit*
	AND
SET	science OR engineering OR technology OR “STEM”
	AND
Africa	Africa*
	AND
Mobile learning	“mobile learning” OR “mLearning” OR “m-Learning” OR “mobile device*”

Example search strings

Topic	Search terms
Artificial intelligence	"artificial intelligence" OR "machine intelligence" OR "intelligent support" OR "intelligent virtual reality" OR "chat bot*" OR "machine learning" OR "automated tutor" OR "personal tutor*" OR "intelligent agent*" OR "expert system" OR "neural network" OR "natural language processing"
AND	
Education level	"higher education" OR college* OR undergrad* OR graduate OR postgrad* OR "K-12" OR kindergarten* OR "corporate training*" OR "professional training*" OR "primary school*" OR "middle school*" OR "high school*" OR "elementary school*" OR "vocational education" OR "adult education"
AND	
Learning setting	learn* OR student*

Zawacki-Richter et al. (2019)

Example search strings

"emergency remote teaching" OR "student-centred remote teaching" OR "emergency remote education" OR "student-centered remote teaching" OR "COVID-19" OR "COVID19" OR pandemic OR "Corona virus" OR "online pivot"

AND

"K-12" OR kindergarten OR kindy OR "primary school" OR "middle school" OR "secondary school" OR school OR "high school" OR "reception" OR "R-12" OR "junior primary" OR "elementary school" OR "middle primary" OR "upper primary" OR "senior school"

NOT

"public health" OR nonpharmaceutical OR energy OR pharmaceutical OR pharmacy OR clinic* OR pathology OR telemedicine OR inflammation OR patient* OR neurolog* OR telehealth OR surgery OR universit* OR "higher education" OR postgrad* OR undergrad* OR "tertiary education" OR college

Figure 3. Search string

Bond (2020b)

Search strategy

1. Decide what types of studies and data will answer your question.
   - ➢ Empirical research only?
   - ➢ Grey literature?
   - ➢ Both quantitative and qualitative data?

2. Which databases will you search in?*
   - ❑ Web of Science
   - ❑ EBSCO Host (e.g. ERIC)
   - ❑ Scopus
   - ❑ PsycINFO
   - ❑ ProQuest
   - ❑ Teacher Reference Center
   - ❑ Science Direct

* Gusenbauer & Haddaway (2019)

Inclusion/Exclusion criteria

Identify what you are and what you aren‘t looking for.

Inclusion Criteria	Exclusion Criteria
K-12	Higher education, further education
Teaching and learning setting (students, teachers, school leaders, administrative support structures)	No teaching and learning setting
English language	Not in English
Empirical study	Not empirical or primary research
Studies undertaken during the COVID-19 pandemic	Studies undertaken before the outbreak of COVID-19

Bond (2020b)

Inclusion criteria	**Exclusion criteria**
Higher education	K-12, further education
Teaching and learning setting (students, educators, administrators)	No teaching and learning setting
English, German or Spanish language	Not in English, German or Spanish
Empirical study	Not empirical or primary research
Studies undertaken during the COVID-19 pandemic	Studies undertaken before the outbreak of COVID-19
Studies published after January 2020	Published before 2020
Students, educators or administrators as unit of analysis	Unit of analysis not students, educators or administrators

Bond et al. (2021)

Record keeping log

Database searched	**Web of Science**
Search Set	1 and 2
Date of search	10/7/2017
Person searching	Melissa Bond and Svenja Bedenlier
Database settings	Refined by: LANGUAGES: (ENGLISH) AND DOCUMENT TYPES: (ARTICLE) Timespan: 1995-2017. Indexes: SCI-EXPANDED, SSCI, A&HCI, ESCI.
No. Of records obtained	9,517
Search string	TS=(learner* or student*) AND TS=("higher education" OR universit* OR college* OR undergrad* OR graduate OR postgrad*) AND TS=(“educational technolog*” or “learning technolog*” OR “digital learning” OR “digital education” OR "app" OR “digital technolog*” OR “digital media” OR “social media” OR “social network*” OR “social web” OR vodcast* OR podcast* OR “digital broadcasting” OR blog* OR weblog* OR “electronic publishing” OR microblog* OR “interactive whiteboard*” OR simulation* OR forum* OR "computer-mediated communication” OR “computer * network*” OR ePortfolio OR e-Portfolio OR eAssessment OR e-Assessment OR “computer-based testing” OR “computer-assisted testing” OR OER OR “open educational resource*” OR “open access” OR “open source*” OR “information and communication technolog*” OR “information technolog*” OR “social tagging” OR tablet* OR “handheld device*” OR “mobile device*” OR "smart*phone*" OR “electronic book*” OR eBook*) NOT TS=("K-12" OR kindergarten* OR "corporate training*" OR "professional training*" OR "primary school*" OR "middle school*" OR "vocational education" OR "adult education")

Lessons learned and suggestions

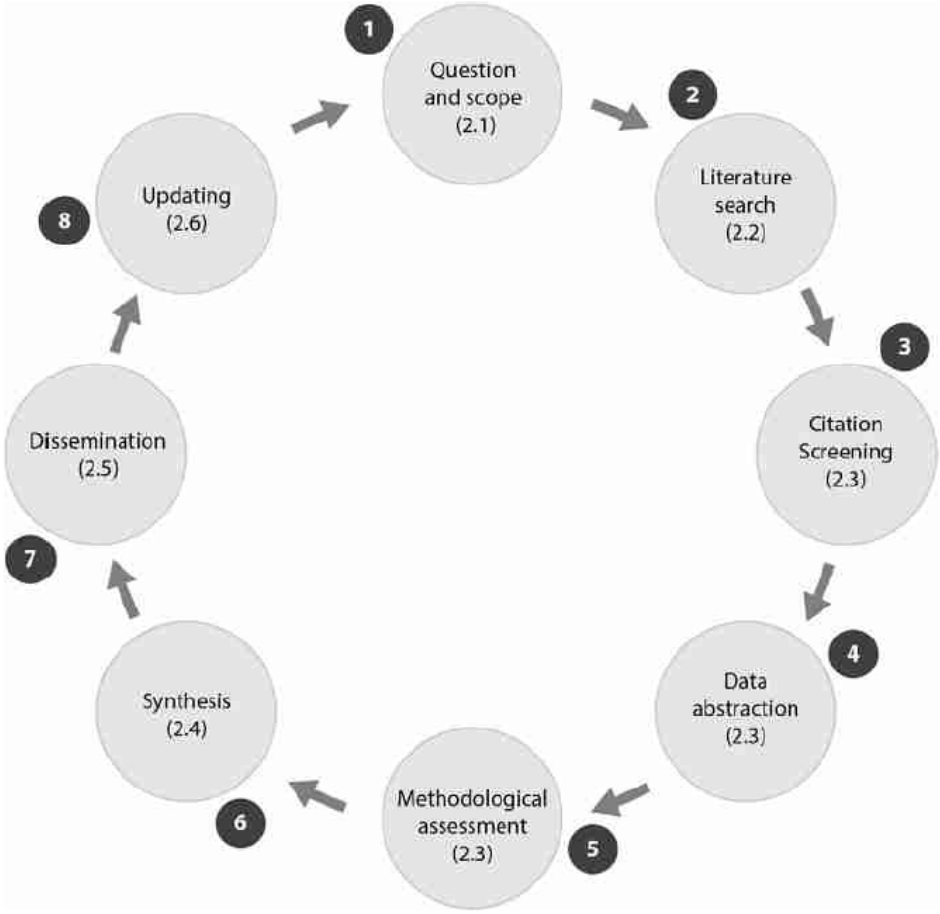


Fig. 1. This figure provides specific steps related to the rapid review process.

Tricco et al., 2020, p. 178

- Seek expert guidance if possible
  - ➢ At least one person on a team
- Keep team small for rapid reviews
- Factor in time scale
- Have a good understanding of RQ and coding scheme between you
- Use evidence synthesis software (e.g. EPPI-Reviewer) and keep all information in one place
- Consider language bias and grey literature
- Utilise machine learning where appropriate
- Include a PRISMA diagram (see Page et al., 2021)
- If planning to publish, have an outlet in mind as early as possible

See also Bond (2021); Bedenlier et al. (2020)

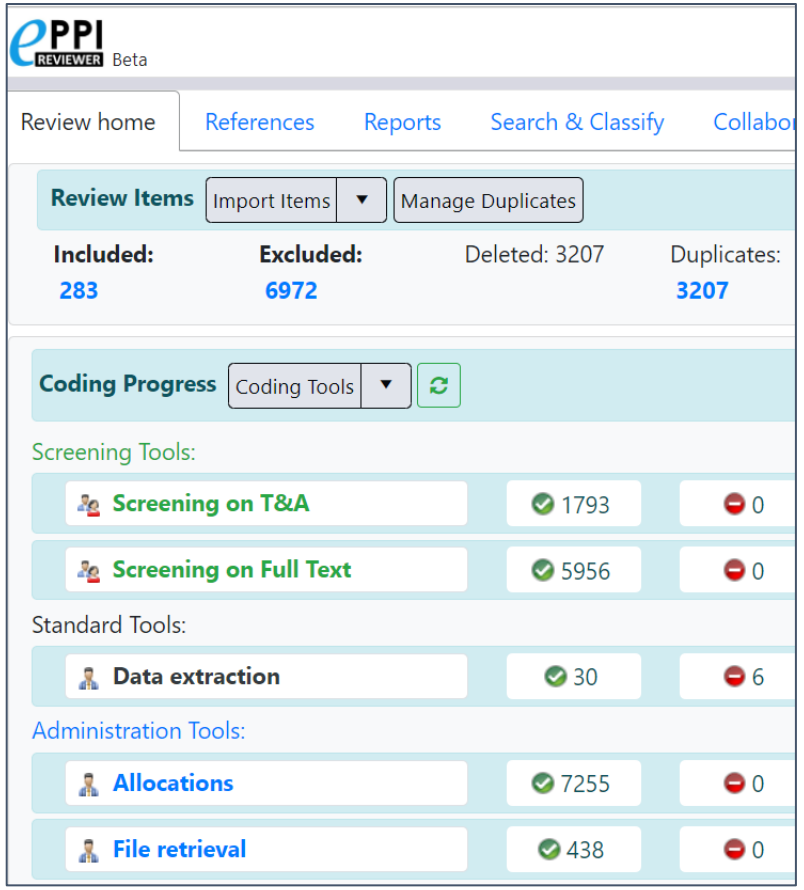
EPPI-Reviewer

EPPI-Reviewer evidence synthesis software was created to support the methodological work conducted at the EPPI-Centre.

- Web-based - accessed from any device with an internet connection.
- Developed for all types of systematic review.
- Designed for flexibility.

EPPI-Reviewer helps by:

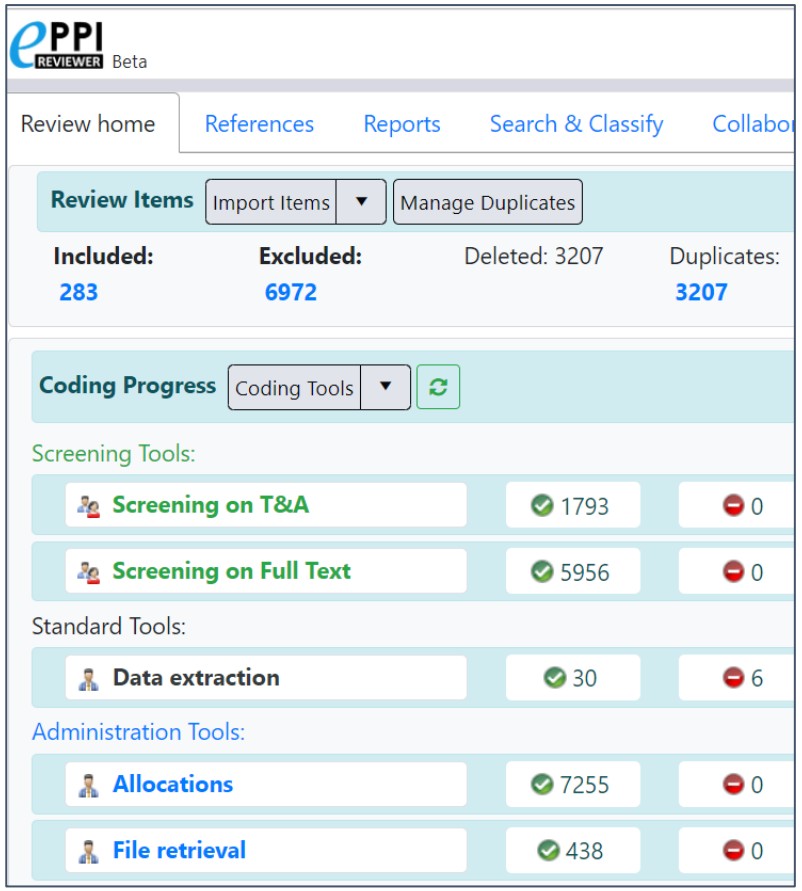
- keeping your review process explicit and replicable
- enabling you to work with many others in one review
- keeping your data in one place
- helping with large screening loads through priority screening
- enabling updates to your review, including through machine learning
- allowing the easy creation of interactive evidence gap maps

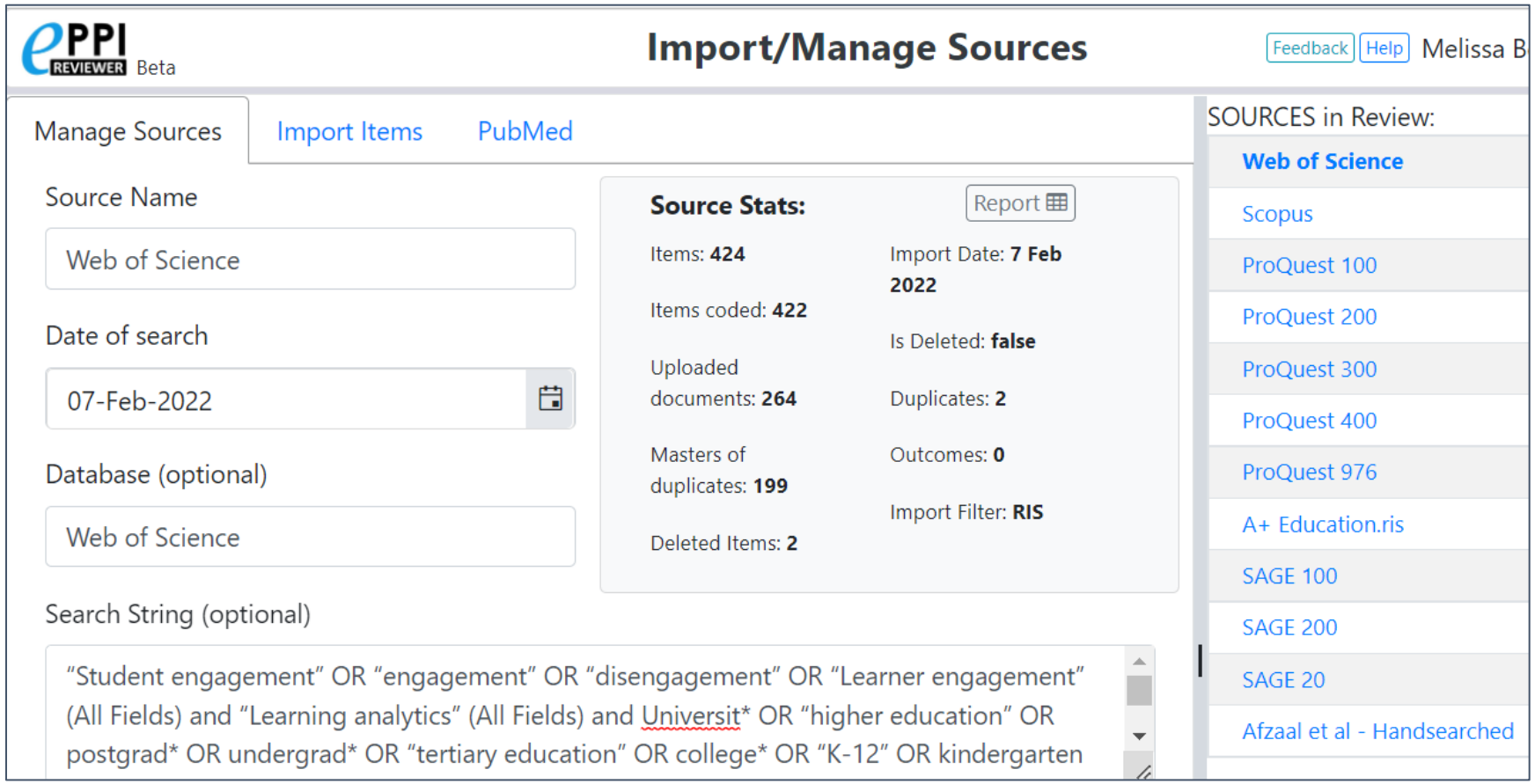


(Thomas et al, 2022)

EPPI-Reviewer

Keeps track of all stages of the review process

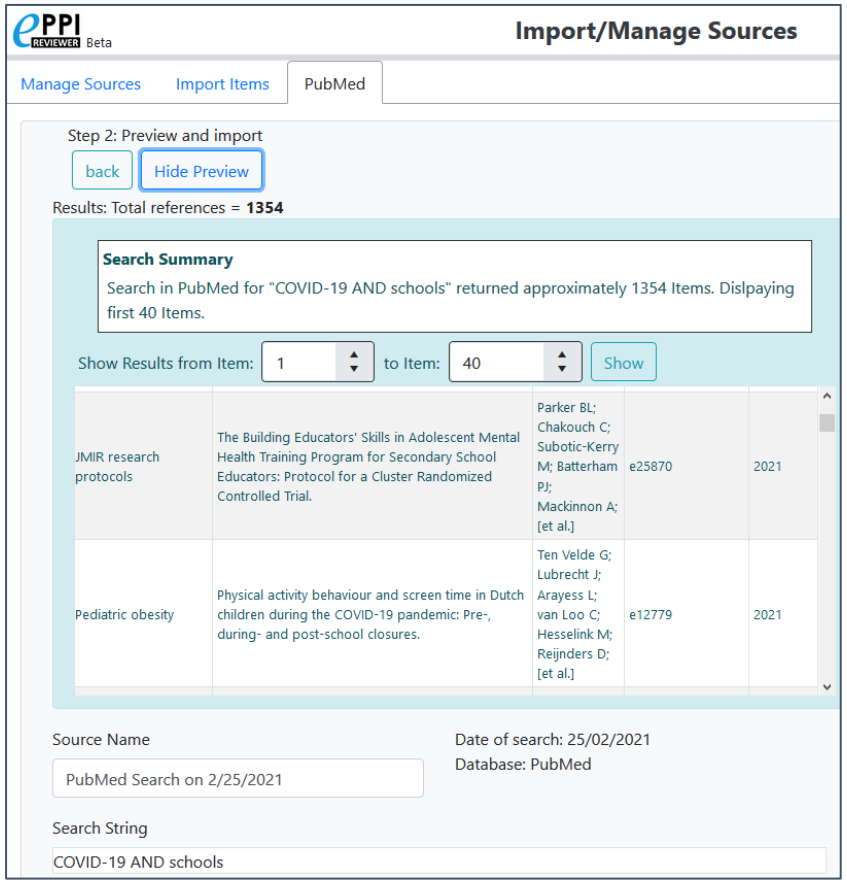


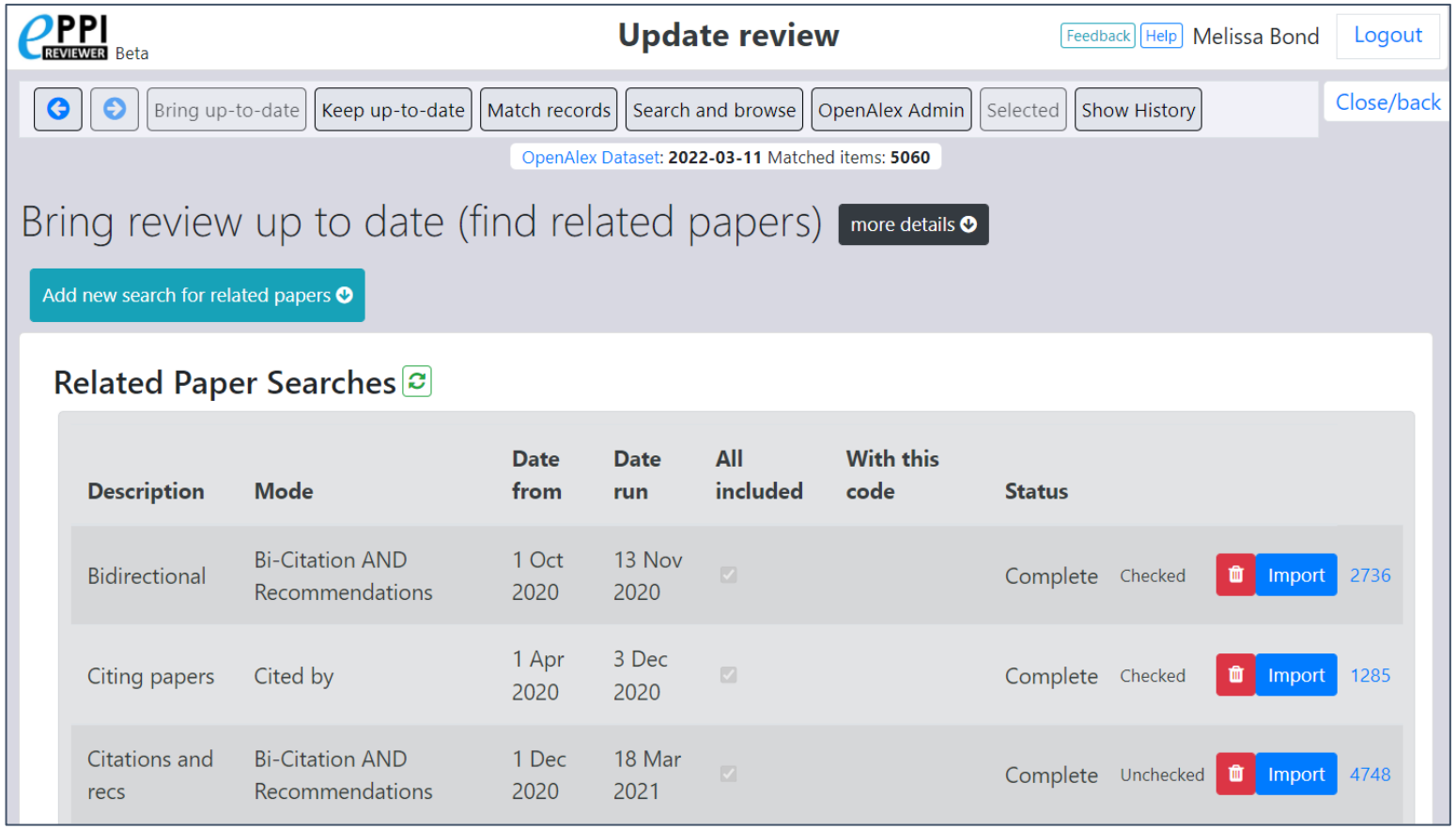


(Thomas et al, 2022)

EPPI-Reviewer

Import references via a range of methods



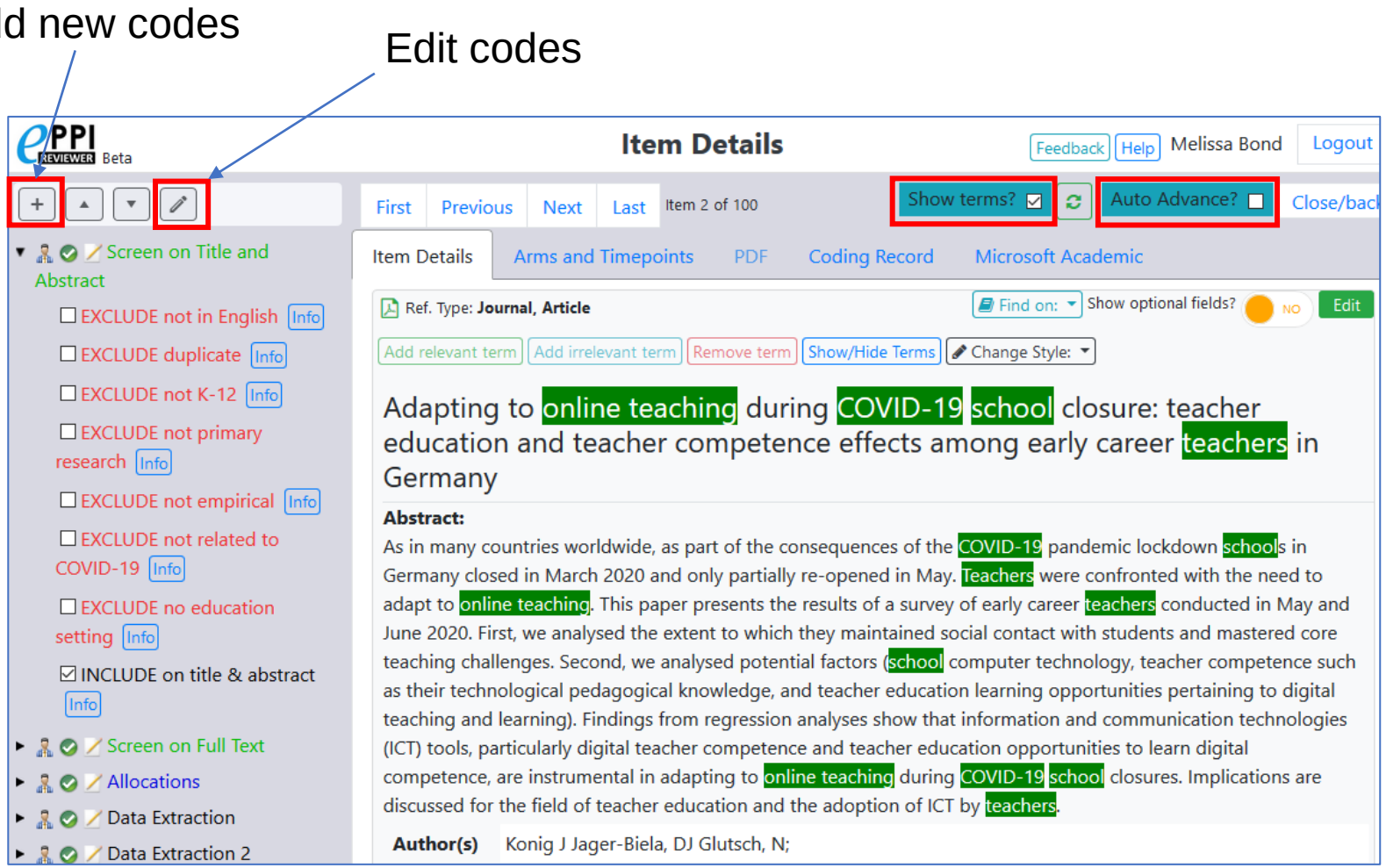


(Thomas et al, 2022)

EPPI-Reviewer

Screening

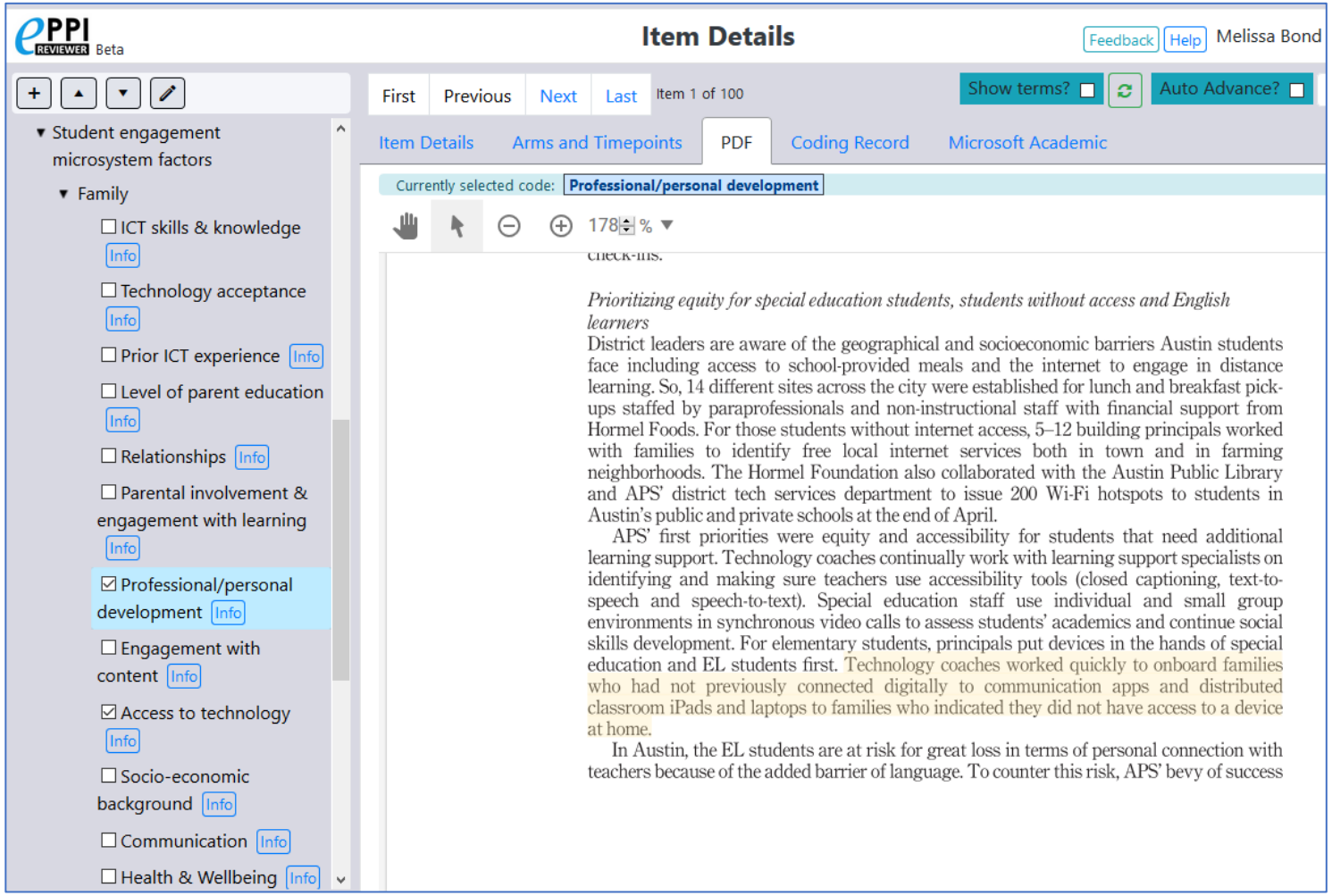
- Enable ***auto advance***
- ***Show terms*** function highlights key phrases
- Use touch device
- Easy to edit and add codes or extra information



EPPI-Reviewer

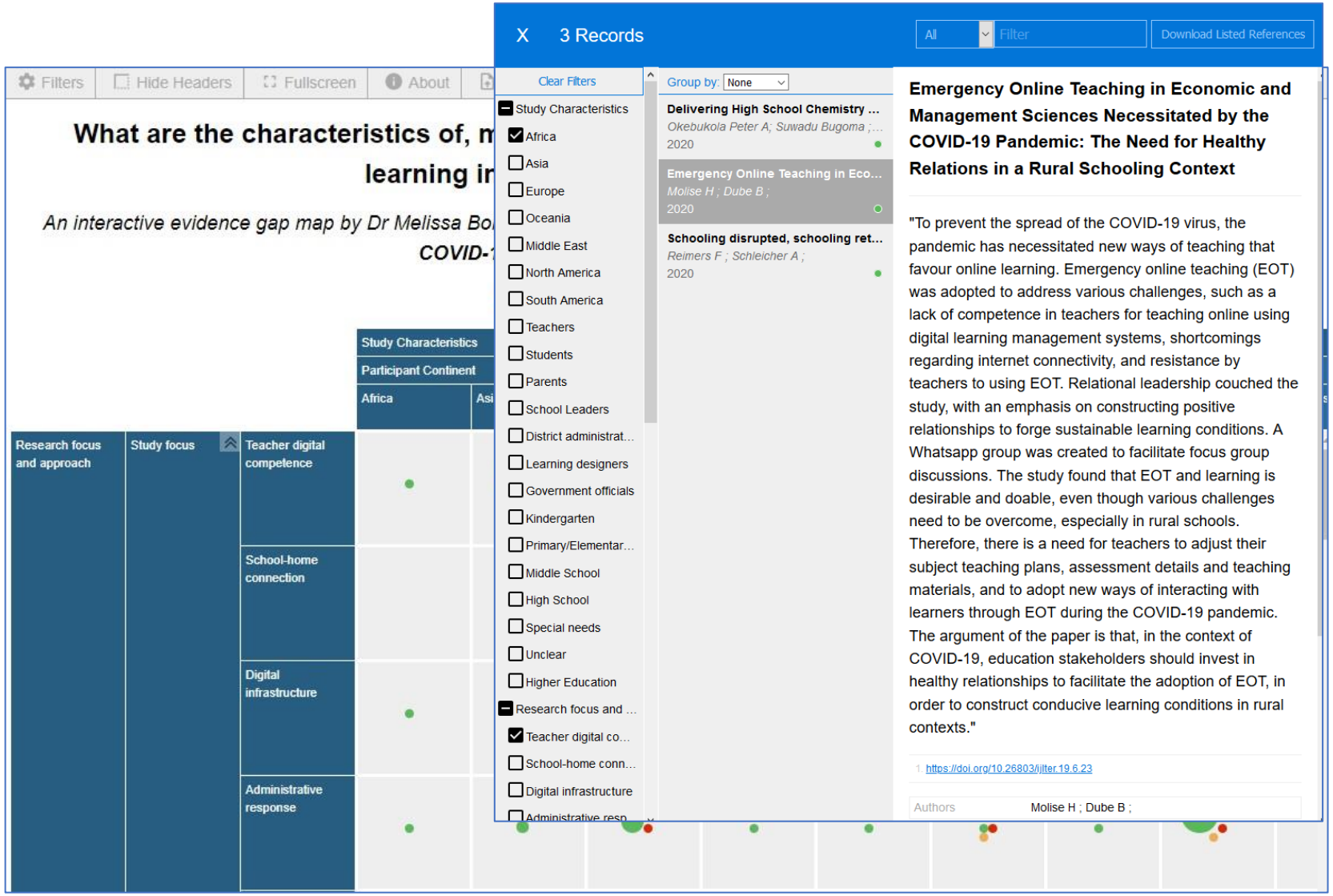
Data extraction

- View PDFs within item records
- Highlight text and assign to codes
- Highlighted quotes appear in reports
- Produce reports with quotes for just one code



Interactive evidence gap maps

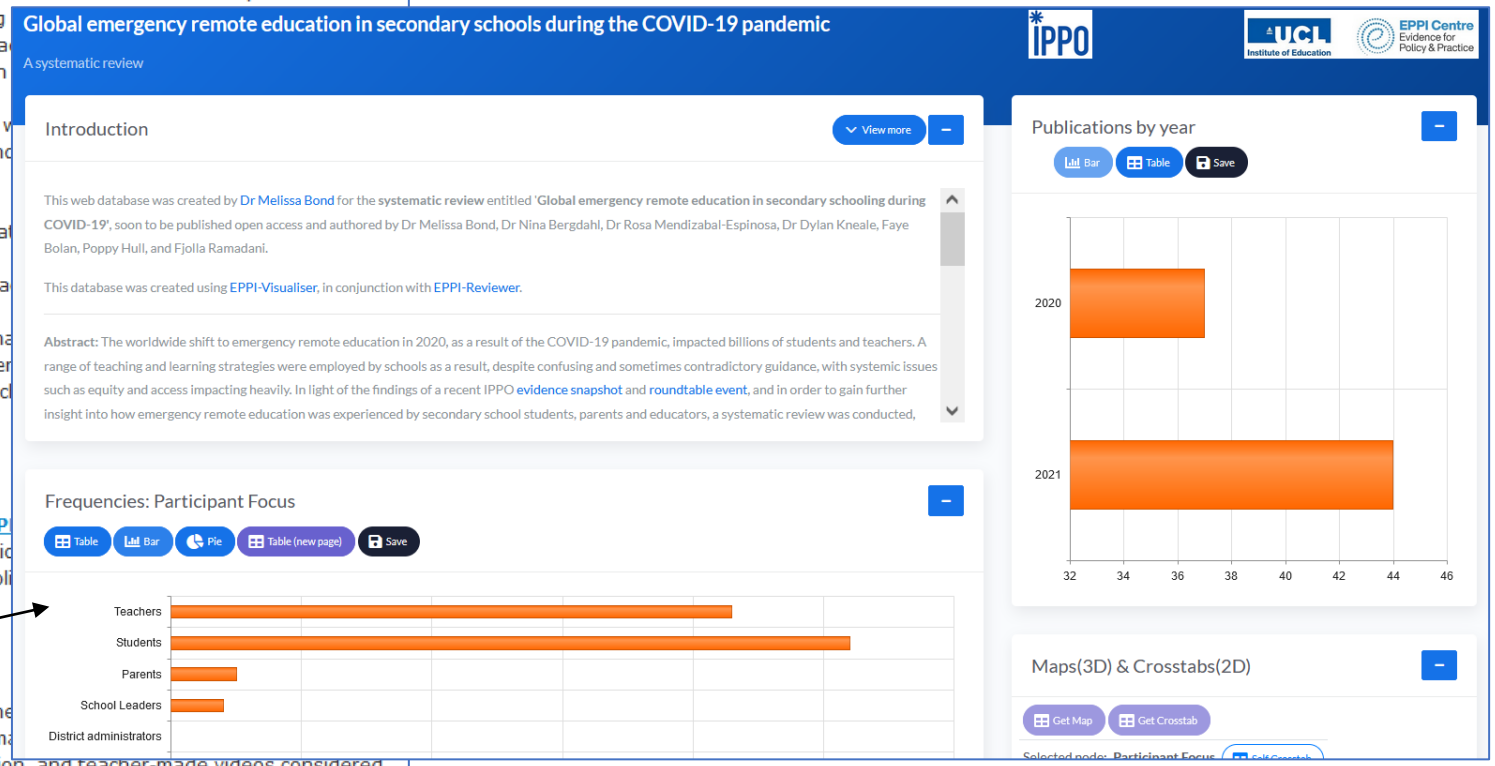
- Created for each research question
- Freely available open access
- Filterable, searchable
- Can download references
- Direct links to studies
- Can assist synthesis



https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3794

Web Database

Openly accessible

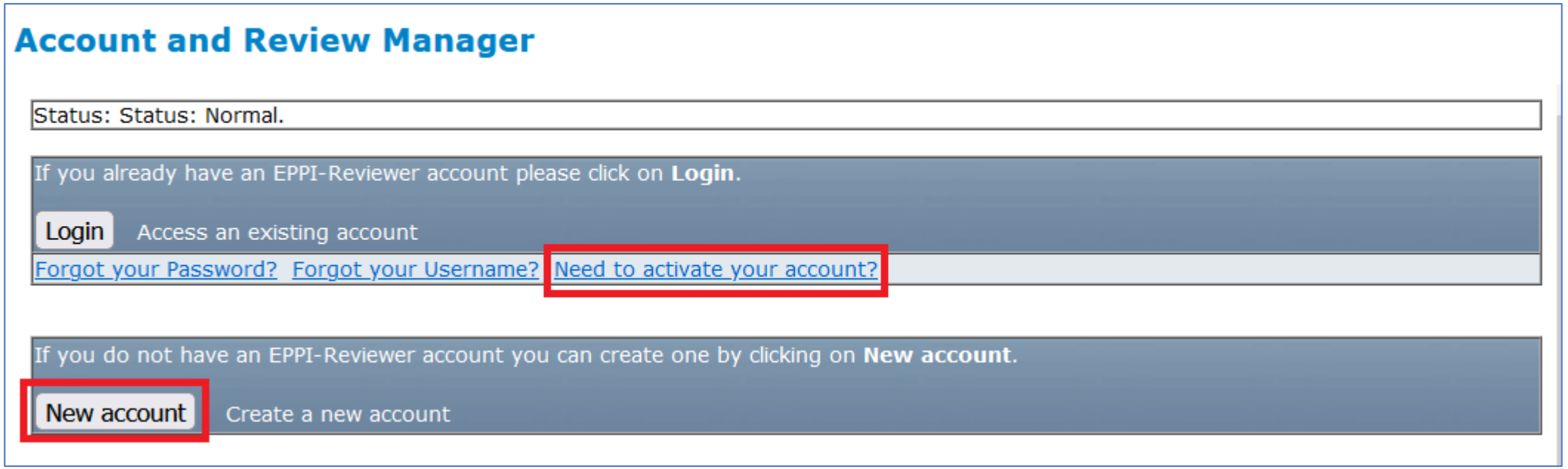


https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3847

EPPI-Reviewer

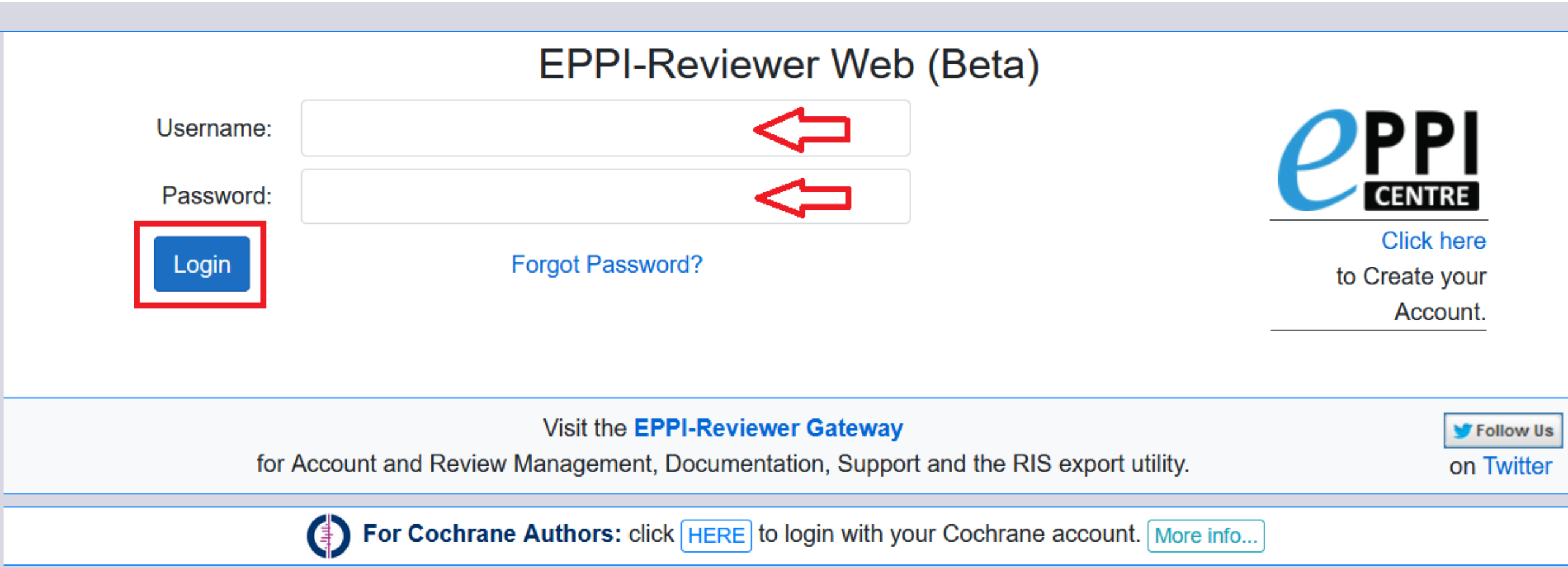
Sign up for an account

If you don’t already have an EPPI-Reviewer account, please sign up for a free trial account here > https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=2935



EPPI-Reviewer

Logging in

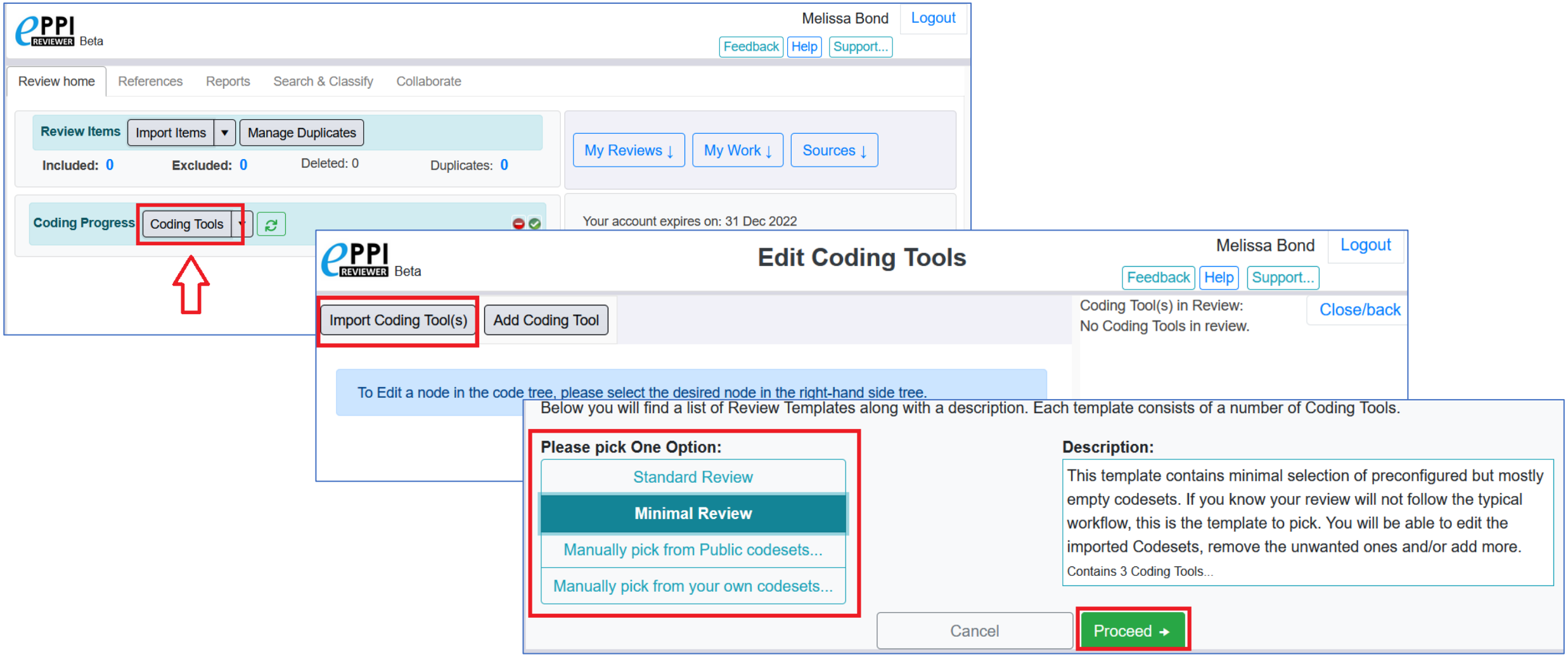


EPPI-Reviewer

Create a new review

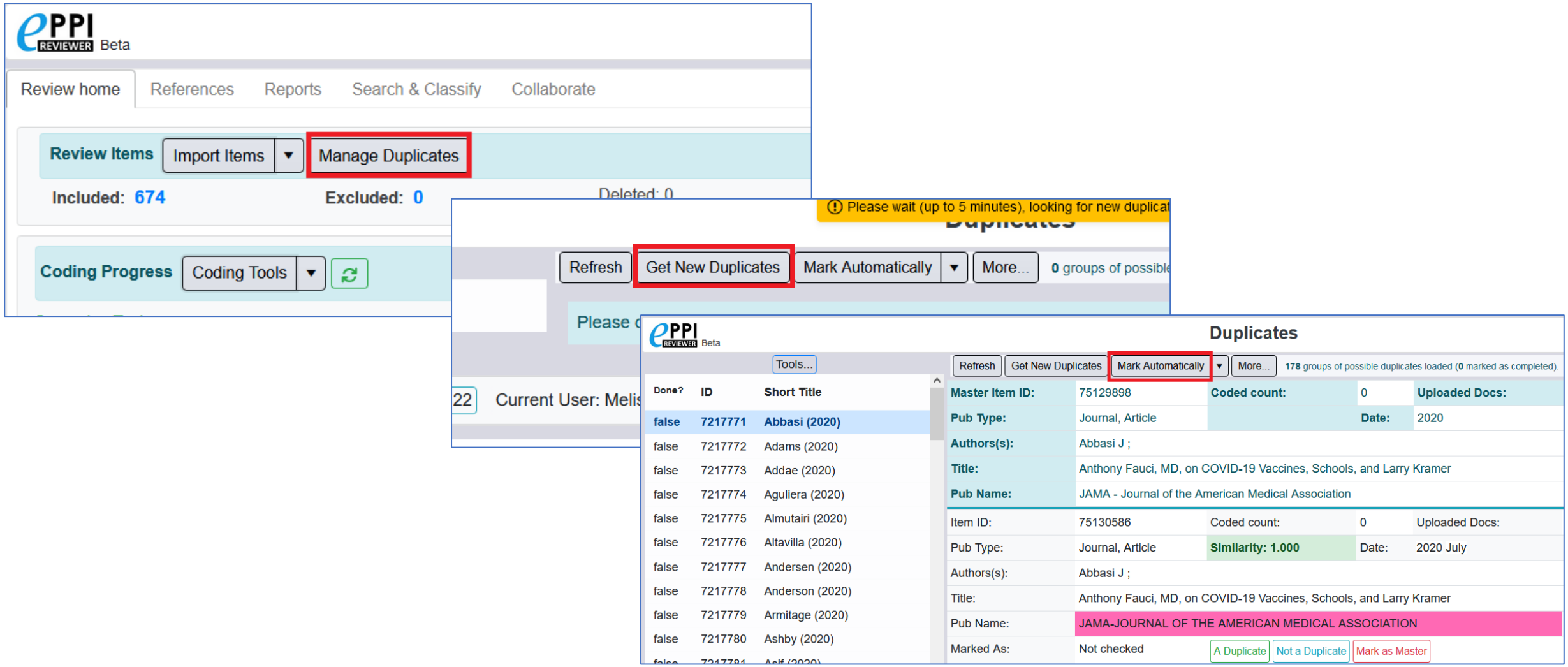
EPPI-Reviewer

Import coding tools



EPPI-Reviewer

Managing duplicates



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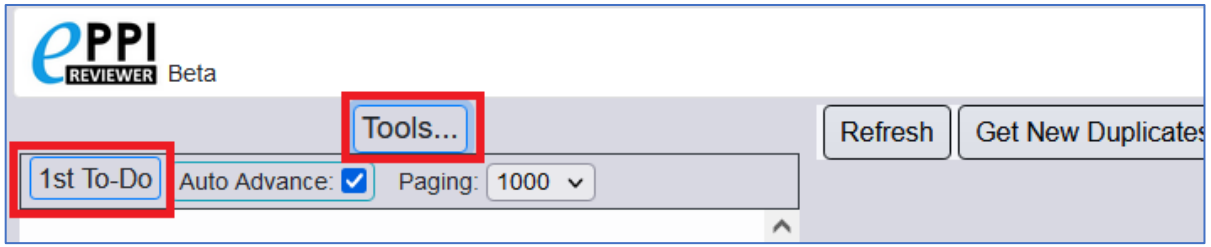
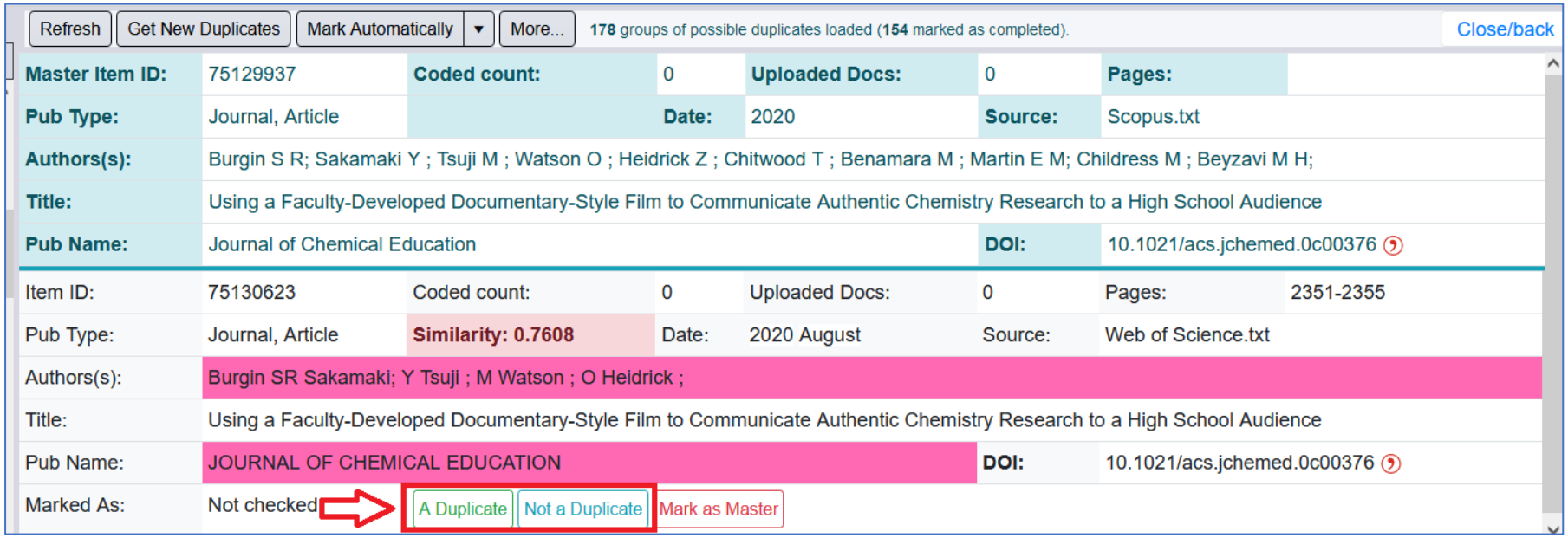
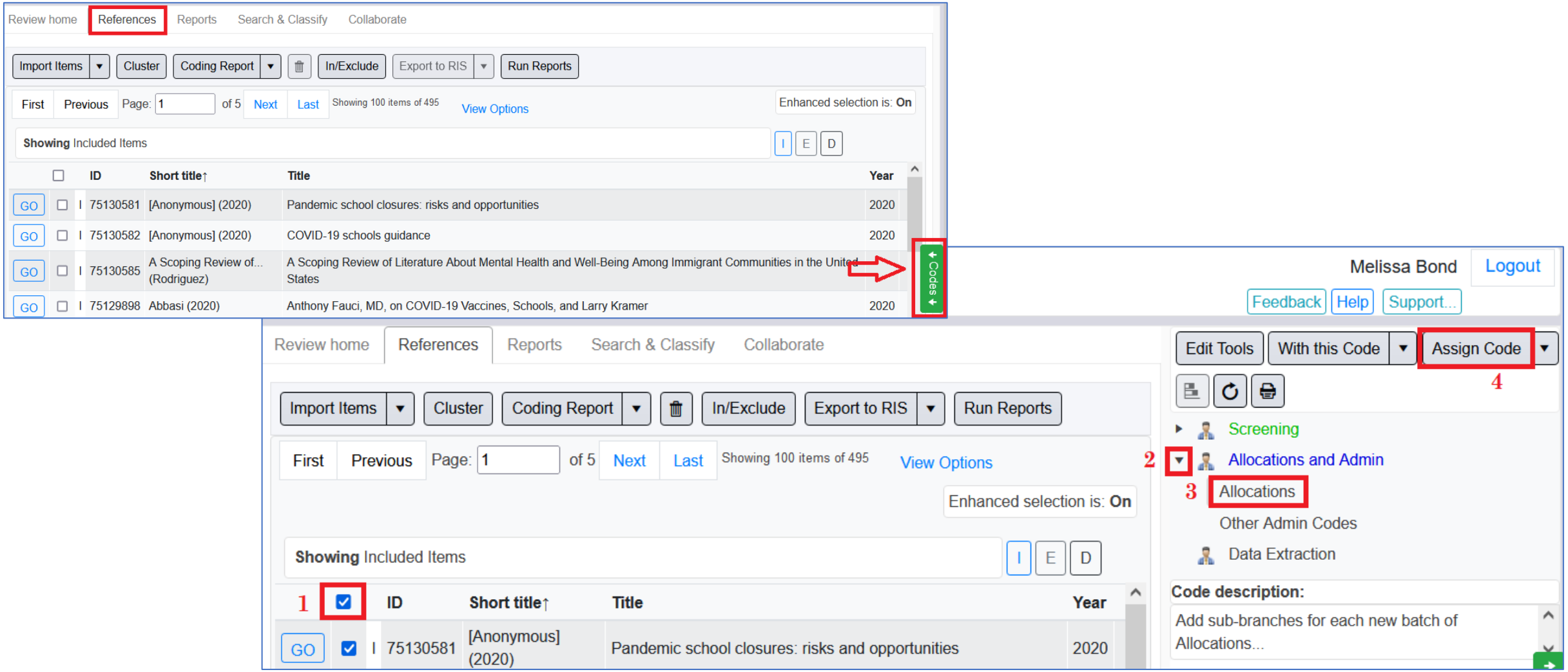
Managing duplicates



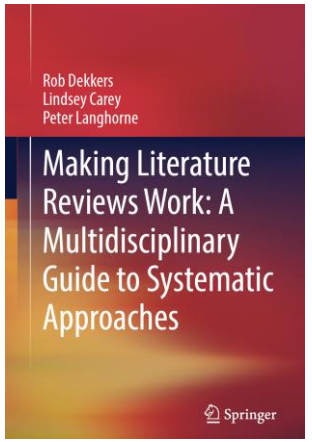


EPPI-Reviewer

Assigning codes



Further Resources



Dekkers at al. (2022)

- Frequently Asked Questions
- EPPI-Reviewer homepage – sign up to a free one month trial.
- EPPI-Mapper information – includes links to example maps.
- EPPI-Mapper app
- EPPI-Reviewer instructional video on interactive evidence gap maps.
- EPPI-Reviewer instructional video on how to create an EGM using EPPI-Mapper.
- Mapping the field of emergency remote teaching in higher education due to COVID-19
- Schools and emergency remote education during the COVID-19 pandemic – information and interactive evidence gap maps.
- Schools and ERE during the COVID-19 pandemic – rapid review article.
- Reach out for hands-on workshops, research collaboration or assistance with conducting reviews - http://drmelissabond.weebly.com/

UniSA | CENTRE FOR CHANGE AND COMPLEXITY IN LEARNING | Education Futures

References

Bedenlier, S., Bond, M., Buntins, K., Zawack-Richter, O., & Kerres, M. (2020). Learning by doing? Reflections on conducting a systematic review in the field of educational technology. In O. Zawacki-Richter, M. Kerres, S. Bedenlier, M. Bond, & K. Buntins (Eds.), *Systematic reviews in educational research: Methodology, perspectives and application*. Heidelberg: Springer Open, Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-658-27602-7_7

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Contact details

Dr Nina Bergdahl
Halmstad University, Sweden
nina.bergdahl@hh.se
Nina.blogs.dsv.su.se
@Nina_Bergdahl

Katja Buntins
University Duisburg-Essen
katja.buntins@uni-due.de

Dr Melissa Bond
University of South Australia
University College London
melissa.bond@unisa.edu.au
@misc_nerd